GUIDELINES FOR USE OF HIGHWAY SPECIFICATIONS FOR HMA AIRPORT PAVEMENTS

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ABSTRACT

Airfield Asphalt Pavement Technology Program (AAPTP) Project 06-05 called for the development of guidelines to be used by practicing airport pavement design engineers on the utilization of state highway hot mix asphalt specifications for use in airport pavements. FAA specifications (P-401, P-401 Superpave and P-403) were first reviewed for current criteria acceptance ranges. State specifications were gleaned to identify general topical areas. Interviews were conducted with each FAA Region Engineer and select State Aviation Offices to gain a better insight as to when, how, which and where state specifications were utilized for airfield projects. Public Law and FAA Orders pertaining to the use of state specifications for airfields were also reviewed.

From the above reviews and interviews, a draft guideline document in the language and format of a draft FAA Engineering Brief (EB) was developed that an experienced engineer could use to develop a state standard airport pavement (SSAP) specification for airports <60,000# aircraft gross weight (AGW). In the draft EB-XX, critical elements were listed as well the recommended approach of how each was to be addressed in order to ensure equal quality and performance as expected with a P-401 mix. The critical elements were traffic, materials, composition, construction, acceptance, quality control, measurement and payment. The draft EB-XX was continually refined through a series of test cases on 10 different state specifications, representing a variety of FAA regions and climatic environments.

INTRODUCTION

Airport versus Highway Pavements

It is important to recognize that airport pavements are fundamentally different from highway pavements. Highway pavements are typically constructed to support a high volume of automobile and truck traffic that can amount to thousands of load repetitions per day. The vast majority of airport pavements see only a few dozen aircraft passes per day.

In the absence of high volume loading, the overriding cause of distress in these pavements is the continual exposure to the damaging effects of the sun, air, rain, and other climatic phenomena. Airport pavements predominately exhibit environmental associated distress types, such as weathering, raveling, and cracking. This is especially true for airfields designed to support relatively light weight aircraft, such as General Aviation (GA) airports. On the contrary, highway pavements are more prone to load associated distress types, such as rutting (permanent deformation) and fatigue cracking. Foreign object damage (FOD) is of great concern to the safe operation of aircraft, while it is not a major issue on highway pavements.

Problem Statement

Federal regulations permit the use of State Department of Transportation highway specifications for airports with runways less than 5,000 feet long and that service aircraft weighing less than 60,000 pounds (#) [1]. The use of the state specification provides opportunities to place high quality hot mix asphalt (HMA) pavements for airports at a more

affordable cost. Since state specifications are primarily designed for highway pavements, selection of the proper specification and criteria for airport pavements is not always compatible. Specifications that do not consider key factors for airport pavement performance may result in lower airport pavement performance than typically achieved using Federal Aviation Administration (FAA) criteria.

This paper has been prepared as a guideline for practicing airport pavement design engineers to ensure that the critical elements in the current HMA specifications [P-401, P-401(Superpave) and P-403] are incorporated when state DOT highway pavement specifications are used.

Definitions: State Specification Documents

For use throughout this paper, state specification documents shall be defined and referred to by acronyms as follows:

- "State Standard Highway Pavement (SSHP)" specifications – SSHP is used throughout this document to identify the current State specifications for HMA highway pavements covering materials, mix design and selection, manufacture, transport, placement, compaction and acceptance of HMA pavement as well as the contractor's quality control plan and requirements.
- "State Standard Specifications Manual (SSSM)" - SSSM is used throughout this document to identify the current edition of the State Standard Specifications of Highway Construction, State Standard Specifications for Transportation Systems, State Standard Specification for Road and Bridge Construction, or any other title used for a SSSM.
- "State Standard Airport Pavement (SSAP)" specifications – SSAP is used throughout this document to identify a State specifications for HMA airport pavements developed in accordance with the guidance provided by AC 150/5100-13A and submitted for FAA approval. The SSAP must comply with critical requirements for airport pavements and instructions on how to reference, or insert, portions of SSHP specifications.

BACKGROUND INVESTIGATION

FAA Specifications

The current FAA P-401, P-401(Superpave) and P-403 specifications were afforded a detailed review to establish criteria for <60,000# AGW. The current criteria and acceptance procedures for airfield pavement were categorized in the areas associated with materials, composition, construction, quality control, and acceptance for <60,000# AGW. The P-401 and P-401(Superpave) criteria requirements are designated as an airport pavement surface course. The P-403 specifications are applicable as airport pavement surface course for <12,500# AGW and all airport pavement base and leveling course for all AGW classifications.

SSHP Specifications

The SSHP specifications from the following 16 states were reviewed: AL, CA, FL, GA, KY, MO, MN, MS, MT, NC, OH, PA, SC, TN, TX and WA. It was verified that throughout the

United States, the individual SSHP specifications covering HMA pavement have different titles, identification numbers, and a wide range of requirements and acceptance criteria. This was attributed to a number of reasons, such as local experience, different materials, environmental conditions, etc. The overall general requirements of a SSHP specification were grouped under the topical areas that were similar to airport pavement specifications as follows:

- **Description:** definitions, explanations, etc.
- **Materials:** normally covers coarse aggregate, fine aggregate, asphalt binder, reclaimed asphalt material, etc.
- **Composition:** includes information about the mix design and job mix formula. This is under "Materials" in some SSHP specifications.
- **Construction:** includes information on plant, equipment, placement and compaction procedures, etc.
- **Acceptance:** establishes the criteria and measure for material acceptance based on established sampling and testing requirements.
- **Quality Control:** information for Contractor's quality control program for process control.
- **Measurement:** identifies unit (units) for accountability.
- **Payment:** identifies item (items) per unit for payment calculation.

These topical areas were utilized for the organization of the guidelines to use highway HMA standard specifications for airports.

In reviewing the SSHP specifications, it was clear that the formats from state to state were very different. Of even greater significance and an even greater challenge was the multiple cross references in SSHP specifications to various sections of the state specific SSSM, state specific testing procedures, state specific nomenclature, etc. Some SSSMs and State test manuals were over 1000-pages in length. Most SSHP specifications referenced state test methods versus ASTM or AASHTO test methods.

FAA Region Engineers – Interviews

The FAA Region Engineers who prominently deal with airport pavements were individually interviewed to determine the following information:

- Past history in regard to submittal and approval of modification to standards (MTS) for the use or adaptation of state highway pavement specifications to meet FAA requirements for <60,000# AGW.
- Activity to develop state standards for <60,000# AGW via the guidelines provided by AC 150/5100-13A, Development of State Standards for Nonprimary Airports [1].
- Identification of Block-Grant States [BGS], and the significance of BGS status with regards to the use of highway specifications for airports.
- Whether the P-401(Superpave) was being utilized as a MTS versus using P-401 or P-403. It was important to assess whether and how Superpave was being used by the different regions and state aviation offices.

The interviews also addressed three material acceptance related topical areas that were determined to be critical and if a general consensus existed in order to know how the final technical guidance should be written. These three topical areas were:

- Importance of having a separate material acceptance pay item for joint density.
- Need to use the statistical percent within limits (PWL) procedure for material acceptance.
- Relying on Contractor's quality control (QC) test data as the basis for material acceptance/quality assurance (QA), versus independent QA testing overseen by the owner or owner authorized representative (OAR).

Current FAA specifications P-401, P-403 and P-401 (Superpave) each have a joint density pay item; use PWL for pay and acceptance, and base pay and acceptance on independent QA testing.

Conclusions from these interviews with each FAA Region Office were as follows:

- AC 150/5100-13A provides a procedure for approval of State standards that is permitted under in US Code 47105(c).
- There had been little response to AC 150/5100-13A, with the exception of some BGS. The BGS may use state highway specifications with modifications. In most other states the P-401 was predominantly being used.
- For <60,000# AGW projects, it appeared that the use of P-401 (Superpave) for airport pavement was occasionally being implemented in the Southeast; less often in other states East of the Mississippi River; and least often in states West of the Mississippi River.
- The P-401 was used much more often than P-401 (Superpave). The P-403, essentially P-401 without PWL, was being used as intended for <12,500# AGW pavement.
- FAA Region Engineer consensus on the three material acceptance issues was:
  - Joint Density – should remain a pay factor item for airport pavement.
  - PWL Procedures – Strongly support PWL procedures for primary airport pavement, but may endorse dropping PWL procedures on small projects and <60,000# AGW.
  - Contractor QC for material acceptance – Support the overall FAA policy to retain material acceptance under Owner (or OAR) oversight.

State Aviation Office (SAO) - Interviews

It was concluded there was not a clear understanding for a strategy to implement SSHP specifications, nor was there a clear vision of the end product for implementing SSAP specifications. It was decided that the following additional information needed to be sought through interviews with select SAOs:

- Within the state, to what extent had SSHP specifications been used on projects for pavements serving the following three AGW categories: <12,500#, 12,500 to 30,000#, and 30,000# to 60,000#?
- If SSHP specifications were used, which one(s) and under what conditions?
- Have SSHP specifications been modified for use on airport projects (as SSAP specifications)? If yes, had this modification been approved by FAA and was this modified specification available?

- If SSHP specifications were not used, which FAA specifications [P-401, P-401 (Superpave) and P-403] were used for the three AGW categories above.
- Was the estimated size of the project a consideration for the specification used?

The conclusions drawn from these interviews were:

- The SAOs, and specifically the supporting Consultants, were reluctant to submit a MTS for use of SSHP specifications modified as SSAP specifications for a specific project.
- A few states, including NC, TN, FL, GA and MS, are using SSHP specifications for <12,500# AGW airport pavement projects. In some cases, the <12,500# AGW criteria may be stretched, normally through coordination with the FAA ADO of authority. This practice was being carried out with a 10-year moratorium on future federal funding imposed by Public Law 106-181 because there were no FAA approved SSAP specifications.
- When SSHP specifications were used for airfields, they were normally based upon the Superpave Mix Design method since the majority of states had adopted Superpave. When FAA specifications were used, they were normally based upon the Marshall Mix Design method because that was the method that P-401 and P-403 utilizes.
- For airport projects supporting 12,500# to 60,000# AGW, the P-401 was predominantly used in accordance with FAA standards.
- The SAOs, and specifically the supporting Consultants, were reluctant to submit a MTS for using the P-401 (Superpave) specification in lieu of the P-401.

In summary, there appeared to be only a few States using SSHP specifications, which were predominantly Superpave, and generally only when the project was for pavement <12,500# AGW. These individual projects using SSHP specifications were accomplished with the understanding that there was a 10-year moratorium for future federal funding. These interviews also revealed that a better understanding of the Public Law and FAA Orders that currently pertain to and influence the use of state standards (and SSHP specifications) for airports was needed.

Public Law and FAA Orders

The AC 150/5100-13A was published on September 28, 1999 [1]. This FAA advisory circular provides guidelines for the development of state standards for nonprimary public-use airports as provided for in Title 49 United States Code; Section 47105 (c) and FAA Order 5300.1F. Three categories of standards are mentioned; Configuration Standards, Design Standards, and Construction Standards. HMA specifications fall under Construction Standards. The 5100-13A includes guidance for incorporating SSHP specifications into state standards for pavements serving <60,000# AGW when the performance record under equivalent loadings and exposure has been satisfactory. The application process, approval authority, and necessary conditions are also provided in the AC 150/5100-13A.

There appeared to be a misunderstanding with Title 49 United States Code Section 47114(d) (5) and FAA Order 5100.38C; wherein, these directions were applicable to use of state highway specifications for a specific project through the MTS procedures. In this case, there was a limitation stating that “An airport may not seek funds under this subchapter for runway

rehabilitation or reconstruction of any such airfield pavement constructed using State highway specifications for a period of 10 years after construction is completed unless the Secretary determines that the rehabilitation or reconstruction is required for safety reasons."

By understanding the legal and authoritative directives impacting the use of SSHP specifications for airports, a clear "strategy" was developed. This strategy was based on the understanding that:

- AC 150/5100-13A provides a procedure for approval of State standards that is permitted under in US Code 47105(c).
- A "State Standard Airport Pavement (SSAP)" specification can be developed by each state for HMA airport pavements developed in accordance with the guidance provided by AC 150/5100-13A and submitted for FAA approval. The SSAP must comply with critical requirements for airport pavements and instructions on how to reference, or insert, portions of SSHP specifications.
- In order for the 10-year limitation period on future federal funding to not apply, it is necessary that a State submit SSAP specifications in accordance with AC 150/5100-13A for approval by FAA Order 5300.1F. This premise is applicable for all weight categories of aircraft <60,000# AGW**.**
- By developing a SSAP specification and getting proper FAA approval, the SAOs can then routinely use it on airport projects without being subject to the 10-year federal funding limitation. That is not the case if a single project uses a SSHP specification that has been used, modified or not modified, under MTS procedures as a SSAP specification for a specific airport pavement project.

STRATEGY

The format for a guideline development strategy evolved from an in-depth review of the current FAA airport pavement specifications [P-401, P-401 (SP), and P-403] and the 16 individual SSHP specifications. As a result of these SSHP specification reviews, it was determined that the SSHP specifications throughout the United States had different titles and identification numbers, diverse nomenclature and formats, and had a wide range of requirements and acceptance criteria. In addition, the SSHP specifications in all the 16 states had a rather complex matrix of cross referencing among other related SSSM standards, test methods, etc. However, as discussed earlier, the overall general requirements of the SSAP specifications could be grouped under the eight generic topical areas contained in the FAA and SSHP specifications, as follows:

- Description.
- Materials.
- Composition.
- Construction.
- Acceptance.
- Quality Control.
- Measurement.
- Payment.

SAO discussions and review of the Public Law and FAA Orders led to the conclusion that a checklist document should be written in the format and language of a draft FAA Engineering Brief (EB). It was the consensus that providing a checklist document in the format of an EB would assist the FAA to facilitate implementation of SSAP specifications. It was further concluded that the SAOs would be more likely to develop and use SSAP specifications on airport projects for <60,000# AGW if provided guidance in the form of an EB. Therefore, the draft checklist document was developed as a Draft EB-XX, and referred to as Draft EB-XX from this point forward in this paper.

GENERAL CHECKLIST REQUIREMENTS FOR DRAFT EB-XX

In view of the strategy outlined above, the critical technical elements that the Draft EB-XX must address, along with the approach of how they will be addressed, are provided below for the eight topical areas, and listed as Element 1 through Element 8 for inclusion into a Draft EB-XX:

Element 1: Description – Correlation between Traffic ESALs to AGW <60,000#. It became very apparent that a correlation between aircraft loading levels and highway traffic levels was needed to bridge the criterion used in SSHP specifications (based on ESALs) and those used in SSAP specifications (based on AGWs). The approach and rationale in developing this necessary correlation are summarized in Table 1.

Starting from the left of Table 1, three AGW categories were mentioned in the AC 150/5100-13A; <12,500#, 12,500# to <30,000#, and 30,000# to < 60,000# [1]. Maybe not coincidentally, these are the same categories as annotated in the RFP for AAPTP Project 06-05 [2]. It should be noted that AC/5100-13A covers three categories of standards; Configuration Standards, Design Standards, and Construction Standards. This application pertained to Construction Standards. AC 150/5320-6D provides the FAA's pavement thickness design guidance [3]. Essentially, the light aircraft charts are used for <30,000# while the LEDFAA software is used for >30,000#. There is a note providing guidelines for the use of state mixes for <12,500#.

Construction Standards having to do with asphalt binder selection and mix design criteria appear to be independent of the 30,000# breakpoint, as depicted by P-401 [4], P-401 (Superpave) [5], AAPTP Project 04-02 [6], AAPTP Project 04-03 [7], AASHTO M-323 [8], and AI SP-2 [9]. For both P-401 and P-401 (Superpave), grade bumping of the binder is recommended at >12,500#, and there is no other guidance change until >60,000#. There is no change at 30,000#. The mix design compaction level is constant in P-401 and P-401 (Superpave) for all AGWs <60,000#, being 50 blow Marshall and Ndes of 65 gyrations, respectively. In the Draft Final Report for AAPTP Project 04-02, the binder grade selection criteria changes at 12,500# and 60,000#, but not at 30,000#. In the Final Report for Project AAPTP 04-03, the suggested gyration levels also change at 12,500# and 60,000#, but not at 30,000#.

Starting on the far right side of Table 1, the AASHTO highway ESAL traffic categories for binder selection and mix design guidance are: <0.3 million ESALs, 0.3 million to 3.0 million ESALS, and then higher ESAL levels [8][9]. By bridging similar criterion regarding binder grade bumping and N-design levels, it becomes apparent that the 30,000# AGW breakpoint is

Table 1 –Approach to Correlate Between AGW and ESAL Categories.

Reference [1]	Reference [2]	Reference [3]	Reference [4],[5], [6], [8], & [9]	Reference [7]	Reference [8] & [9]	Reference [8] & [9]
AGW Categories	AGW Categories	Thickness Criteria	Binder Criteria	Ndes Gyrations	Ndes Gyrations	ESAL Categories
0 to <12,500#	0 to <12,500#	Use Light A/C Charts(w/ Note)	Standard Grade	50	50	0 to <0.3 M
12,500# to <30,000#	12,500# to <30,000#	Use Light A/C Charts	Bump Grade	65	75	0.3M to <3.0M
30,000# to <60,000#	30,000# to <60,000#	Use LEDFAA Software				

not necessary for the Draft EB-XX and the correlation between AGW and ESAL categories should be as shown in Table 2, which was incorporated as an integral part of the Draft EB-XX.

Table 2 – Traffic Level Correlation for Superpave HMA Mixtures

Traffic Level	Million ESALs	Aircraft Gross Weight, (#)
A	**<0.3**	**<12,500**
B	**0.3 to <3.0**	**12,500 to <60,000**

Element 2: Materials – Use of SSHP specifications for material requirements were recommended. This requirement should be sufficient in most State DOTs. Aggregate gradation must be tied to AASHTO M 323 with the exception of NMAS 4.75 mm mixtures, which are not recommended for airfields. Asphalt binders must be as specified in AASHTO M 320. Use of SSHP specifications for tack coat requirement was recommended.

Element 3: Mix Composition (Mix Design) – The Contractor must submit to the Engineer the results of verification testing of three (3) HMA samples prepared at the optimum asphalt content. For the Job Mix Formula (JMF) submittal, the average of the results of this testing must indicate conformance with the JMF requirements, except as modified herein, for criteria listed as follows:

- Marshall Method - Stability [pounds], Flow [0.01 in], Air Voids [percent], and Voids in Mineral Aggregate [percent], Tensile Strength Ratio [percent].
- Superpave Method **-** Ndes Gyrations, Nini Gyrations, Nmax Gyrations, Air Voids @Ndes [percent], Voids Filled with Asphalt @ Ndes [percent], Dust Proportion [percent], Fine Aggregate Angularity, %Gmm@Nini, %Gmm@Nmax, Tensile Strength Ratio [percent].
- Marshall Method - The aggregate gradation must be specified from Table 3. The gradations are defined by maximum aggregate size (MAS), which is the sieve size that is one size larger than the first sieve to retain material.

Table 3 - Aggregate Gradation, After FAA Item P-401 & P-403.

Sieve Size	All Pavements			
	Percent by Weight Passing Sieves			
	1.5 in. MAS	1.0 in. MAS	3/4 in. MAS	1/2 in. MAS
1.5 in.(37.5 mm)	100	100	100	100
1.0 in.(25.0 mm)	86 to 98	100	100	100
¾ in.(19.0 mm)	68 to 93	76 to 98	100	100
½ in.(12.5 mm)	57 to 81	66 to 86	79 to 99	100
⅜ in.(9.5 mm)	49 to 69	57 to 77	68 to 88	79 to 99
No. 4(4.75 mm)	34 to 54	40 to 60	48 to 68	58 to 78
No. 8(2.36 mm)	22 to 42	26 to 46	33 to 53	39 to 59
No. 16(1.18 mm)	13 to 33	17 to 37	20 to 40	26 to 46
No. 30(0.600 mm)	8 to 24	8 to 24	14 to 30	19 to 35
No. 50 (0.300 mm)	6 to 18	4 to 12	9 to 21	12 to 24
No. 100(0.150 mm)	4 to 12	6 to 16	6 to 16	7 to 17
No. 200 (0.075 mm)	3 to 6	3 to 6	3 to 6	3 to 6

- Superpave Method **-** The aggregate gradations must be specified from Table 4. The gradations are defined by nominal maximum aggregate size (NMAS), which is one sieve

Table 4 - Aggregate Gradation Control Points, After AASHTO M 323.

Sieve Size	All Pavements				
	Percent by Weight Passing Sieves				
	1 1/2 in NMAS	1.0 in. NMAS	3/4 in NMAS	1/2 in NMAS	3/8 in NMAS
	(37.5 mm)	(25.0 mm)	(19 mm)	(12.5 mm)	(9.5 mm)
	Control Points	Control Points	Control Points	Control Points	Control Points
1.5 in (50.0 mm)	100 to 100				
1.25 in (37.5 mm)	90 to 100	100 to 100			
1.0 in.(25.0 mm)		90 to 100	100 to 100		
¾ in.(19.0 mm)	90 to 100		90 to 100	100 to 100	
½ in.(12.5 mm)				90 to 100	100 to 100
⅜ in.(9.5 mm)					90 to 100
No. 4(4.75 mm)					
No. 8(2.36 mm)	15 to 41	19 to 45	23 to 49	28 to 58	32 to 67
No. 16(1.18 mm)					
No. 30(0.600 mm)					
No. 50 (0.300 mm)					
No. 100(0.150 mm)					
No. 200 (0.075 mm)	0 to 6	1 to 7	2 to 8	2 to 10	2 to 10

size larger than the first sieve to retain more than 10 percent. Generally, the NMAS is one sieve size smaller that the MAS. Table 4 aggregate gradations are representative of the NMAS Superpave mixtures with gradations requirements based on control points established by AASHTO M 323.

The combined aggregate gradation must be classified as coarse-graded when it passes below the Primary Control Sieve (PCS) control point as defined in Table 5. All other gradations must be classified as fine-graded.

Table 5 - Gradation Classification, After AASHTO M 323.

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% Passing)					
Nominal Maximum Aggregate Size	37.5 mm	25.0mm	19.0 mm	12.5 mm	9.5 mm
Primary Control Sieve	9.5 mm	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS Control Point (% Passing)	47	40	47	39	47

At the discretion of the design engineer, the 37.5 mm, 25.0 mm, and 19.0 mm NMAS gradations may be used for base and/or intermediate course layers; the 9.5 mm and 12.5 mm NMAS gradations may be used for leveling course layers; and the 12.5 mm and 19.0 mm NMAS gradations are normally specified for surface course layers. All surface course layers must be specified as the fine-graded aggregate classification.

Reclaimed Asphalt Pavement (RAP) Material. RAP material may be used in the JMF in accordance with the following provisions:

- The RAP shall not contain any material that has been treated with a coal-tar sealer rejuvenator or material that contains coal-tar.
- The maximum percent of RAP allowed in the Job Mix Formula is 15% which may be increase up to 30% if the asphalt binder grade is lowered by one grade to account for hardening with the addition of the RAP according to Table 6 [After AAPTP 05-06, Final Report, Use of Reclaimed Asphalt Pavements (RAP) in HMA Mixes of Asphalt Pavements, July, 2008 [10].

Element 4: Construction – Use of SSHP specifications for Contractor QC requirements were recommended. Preliminary review and past experience indicates that SSHP specification requirements were sufficient for SSAP specifications. Exceptions are in the case of joint density and smoothness and grade. These requirements are introduced here and the detailed acceptance criteria were included in the Draft EB-XX.

- Joint Density [**Mandatory FAA acceptance requirement**]. FAA position is that the increase in cost for high quality joints is justified by decrease in maintenance, the absence of maintenance forces in the general aviation operations and inability to shut down pavement for maintenance in the case of air carrier operations.

Table 6 – Recommendation on the use of RAP [After AAPTP 05-06, July 2008].

Type of Mix	Recommended Virgin Binder Grade	RAP Percentage		
		Recovered RAP Grade		
		PGXX-22 Or Lower	PGXX-16	PGXX-10 Or Higher
Surface and Base Mix	No Change in Binder Selection	<20%	<15%	--
Base Mix	Select virgin binder in grade softer than normal (i.e. select a PG58-28 if a PG64-22 would normally be used)	15%-30%	15%-30%	--
Surface and Base Mix	Follow recommendations from blending charts	--	--	<10%

- Smoothness and Grade [**Mandatory FAA acceptance requirement**]. Apply criteria in accordance with FAA Item P-401, Item P-401(SP), and/or Item P-403. The slope and grade requirements have been approved by aircraft manufacturers and operators, and require long-term coordination to facilitate a change.

Element 5: Acceptance - (QA) [**Mandatory FAA acceptance requirement**]. It is a matter of placing the Airport Owner or Owner Authorized Representative (OAR) in the State DOT Contract Management position. Airport Owners do not have a link to State DOT Laboratories as in the case of State DOT Contract Management. The OAR (typically Consultants) may not have the necessary expertise to oversee Contractor QC, so independent Owner QA testing appears to be the only acceptable approach, consistent with current FAA specifications. The FAA's current practice is to pay for independent Owner QA testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the OAR on a lot basis at no cost to the contractor except that coring as required in this section shall be completed and paid for by the contractor. The lot, consisting of four equal sublots, will be consistent with that defined by the SSHP specifications and as a guideline may be considered as one day's production not to exceed 2,000 tons.

Plant Produced Material (PPM). The PPM must be tested by the OAR for air voids in accordance with requirements of SSHP specifications on lot basis.

Field Placed Material (FPM). Material placed in the field must be tested for mat and joint. density by the OAR on a lot basis; thickness in accordance with SSHP specifications; smoothness and grade in accordance with requirements contained in FAA Item P-401.

Acceptance Criteria. Acceptance will be based on the following characteristics of the HMA mixture and completed pavement as well as the implementation of the contractor quality control plan and engineer acceptance test results:

- Air Voids [**Mandatory**]. Evaluation for acceptance of each lot of PPM for air voids must be based on criteria provided by the SSHP specifications. As a guideline for airport pavement, the target PPM air voids is 3.5 ± 1.0 percent for Marshall Method mixtures and 4.0 ± 1.0 percent for the Superpave Method mixtures.
- Pass #8 Sieves [**Optional**]. If and as required by SSHP specifications, or other sections referenced in the SSSM.
- Pass #200 Sieves [**Optional**]. Optional, if and as required by SSHP specifications, or other sections referenced in the SSSM.
- Mat Density [**Mandatory**]. Evaluation for acceptance of each FPM lot for mat density must be based on criteria provided by the SSHP specifications. As a guideline for airport pavement, the average in-place mat density is expressed as a percentage of the average theoretical maximum density (TMD) for the lot. The average TMD for each lot will be determined as the average TMD of the sublots. The average in-place mat density for a lot shall be 94.5% ± 1.0% TMD with the allowable tolerance from 92.0% to 97.0% of TMD for individual tests.
- Joint Density [**Mandatory**]. Evaluation for acceptance of each FPM lot for joint density must be based on the average in-place joint density expressed as a percentage of the average TMD for the lot. As a guideline for airport pavement, the average TMD for each lot will be determined as the average TMD of the sublots. The average in-place joint density for a lot shall be 93.0% ± 2.0% TMD with the allowable tolerance of 91.0% to 97.0% of TMD for individual tests.
- Thickness [**Optional**]. Thickness must be evaluated for compliance by the Engineer to the requirements shown on the plans in accordance with SSHP specifications.
- Smoothness [**Mandatory**]. In accordance with Paragraph 401-5.2(b) (5), Item P-401.
- Grade [**Mandatory**]. In accordance with Paragraph 401-5.2(b) (6), Item P-401.

Element 6: Quality Control – Use of SSHP specifications for Contractor QC requirements were recommended. The Contractor QC requirements were sufficient in SSHP specifications. Correlation with FAA specifications was recommended.

Element 7: Measurement – Use of SSHP specifications for measurement requirements were recommended. The measurement requirements were sufficient in SSHP specifications.

Element 8: Payment – Use of SSHP specifications payment requirements were recommended. The payment requirements were sufficient in SSHP specifications; however, there are administrative restrictions when federal funds are involved. As indicated in previous guidance, it becomes necessary to understand that airports deal with administrative differences in addition to critical technical requirements. As examples,

- A bonus is not eligible for federal grants. A bonus is allowed, but requires an amendment to the federal grant, and is normally not standard practice in AIP Projects because Owners (or

OARs) do not want the administrative hassle and the lead-time required for processing after Contract performance.
- State requirements for pavement density may have to be increased in the event SSHP specifications permit a density < 92.8% Gmm [i.e., the FAA requires reject action at PWL = 50 which is equivalent to the lower tolerance limit of 92.8% Gmm under the PWL].

APPLICATION DRAFT EB-XX TO STATE HIGHWAY SPECIFICATIONS

First State Test Case

After the initial Draft EB-XX was written, the first test case was performed for the Florida DOT (FDOT) to establish test case procedures. The initial Draft EB-XX was applied to the standard FDOT Superpave specification, Section 334 in FDOT SSSM. The resulting SSAP specification for FDOT, labeled as Section 334A, was provided as Appendix A1 to the Final Report. It was written as an amendment to FDOT Section 334, in part, because of the complexity of references in Section 334 to other sections in the FDOT SSSM and FDOT standard test methods. Section 334 was included as Appendix A2 to provide the reader with the entire new airfield specification package. In short, Section 334A modified the critical portions of Section 334 to ensure good performance for airport pavements serving aircraft under 60,000# AGW. Other portions of Section 334, including all references to the FDOT SSSM and test methods, remained unchanged and became an integral part of the new airport pavement specification package, Section 334. To illustrate the complexity of cross referencing that existed in Section 334, a list of referenced sections from the FDOT SSSM was included as Appendix A3 to the Final Report [11]. Other states had similar levels of complexity regarding cross referencing within their SSSM, but similar lists for the other test cases were not provided as part of the Final Report.

Additional State Test Cases

Other test case states selected for developing SSAP specifications were PA, TX, VA, CA, MN, MT, OH and WA, and included as Appendices in the Final Report. A tenth state, MO, had an SSAP specification prior to this effort, and was examined against the guidelines in Draft EB-XX. Figure 1 shows how these states represent a variety of FAA regions and climates.

Throughout the development of these SSAP specifications, iterative adjustments were made to both the SSAP specifications and the Draft EB-XX. Each application of the Draft EB-XX to a particular state served as an independent assessment to determine the sufficiency of the Draft EB-XX in addressing the many complicated areas related to SSHP requirements, nomenclature, composition, and organization items. Each engineer that performed the application had to determine whether each SSHP specification item requirement met or exceeded the comparable critical element requirement identified in the Draft EB-XX. If not, then the engineer had to amend the SSHP as necessary in accordance with the guidelines within the Draft EB-XX.

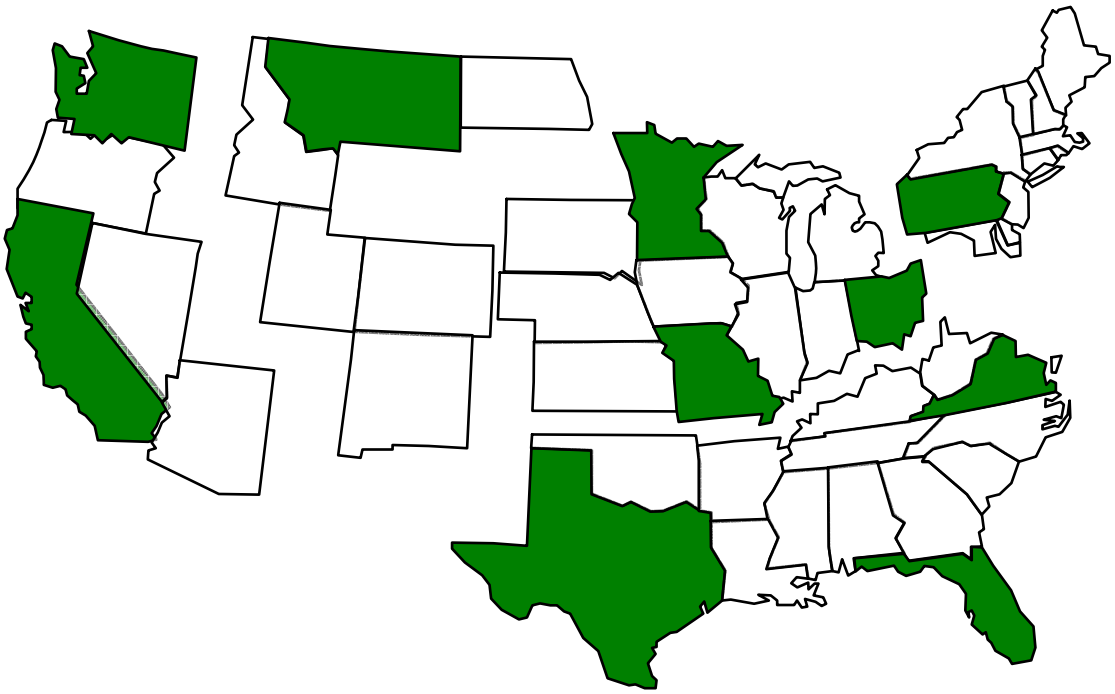

Figure 1 – Geographical Distribution of State Test Cases.

Each of these additional test cases were performed as individual exercises by Asphalt Institute (AI) Regional Engineers, or former Regional Engineer [Boyer], located across the United States as depicted in Figure 2.

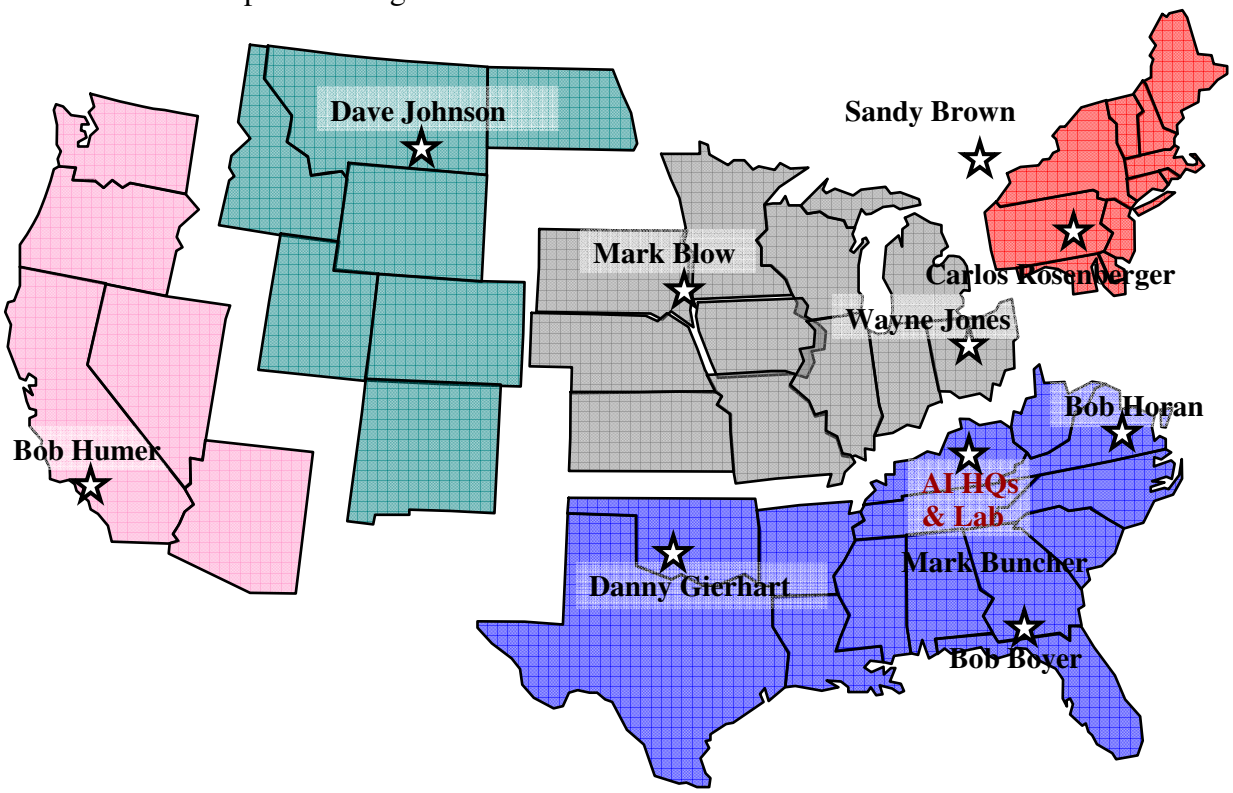

Figure 2 – Distribution of AI Engineers for State Test Cases.

Draft EB-XX

Because of the complex cross referencing of SSHP specifications and test methods in SSSM standards, it was envisioned that the development of the individual SSAP specifications would be performed by an experienced pavements engineer knowledgeable in asphalt materials (perhaps in the State DOT Material Division or a Consultant). The Draft EB-XX was developed and refined for this application. It was further envisioned that the actual SSAP specification may either follow the format of the SSHP specifications of a particular state, or the format of the checklist document [EB-XX] which would generally follow the FAA specifications format; wherein, the former case prevailed in the majority of the test cases.

CONCLUSION

The Draft EB-XX in final format is contained in the Airfield Asphalt Pavement Technology Program, Final Report, Project 06-05 [11], and may be downloaded from the AAPTP website at www.aaptp.us. In addition the Appendices to this Final Report contain the above mentioned State Test Cases; wherein, the SSAP specifications that were developed from the respective SSHP specifications are provided, and the basic SSHP specifications are provided as an accompanied Appendix for user reference purposes.

REFERENCES

1. FAA AC 150/5100-13A, Development of State Standards for Nonprimary Airports, September 28, 1999.
2. Request for Proposal, Project 06-05, Guidelines for Use of Highway Specifications for HMA Airport Pavements, July 27, 2007.
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4. FAA AC 150/5370-10C, Standards for Specifying Construction of Airports, Item P-401, Plant Mix Bituminous Pavement, September 29, 2007.
5. Engineering Brief No. 59A, Item P-401 (Superpave), Plant Mix Bituminous Pavement, May 12, 2006.
6. Draft Final Report, Advanced Asphalt Technologies, LLC, Airfield Asphalt Pavement Technology Program Project 04-02: PG Binder Grade Selection for Airfield Pavements, November 15, 2007.
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8. AASHTO, Standard Specifications for Transportation Materials and Methods of Sampling and Testing, Part 1B: Specifications, 25th Edition, 2006 - AASHTO M 323, Superpave Volumetric Mix Design, 2007.
9. Asphalt Institute, Superpave Mix Design Manual (SP-2), Third Edition, 2001.
10. Final Report, Airfield Asphalt Pavement Technology Program, Project 05-06, Use of Reclaimed Asphalt Pavements (RAP) in Airfields HMA Pavements, July, 2008.
11. Final Report, Airfield Asphalt Pavement Technology Program, Project 06-05, Guidelines for Use of Highway Specifications for HMA Airport Pavements, May 20, 2009.